

Putting the Pieces Together: Mosaic Corporation's Wingate Mine



When the world's leading producer of phosphate crop nutrients set out to boost efficiency, the company trusted its critical data analyses to Minitab Statistical Software.

KEY FACTS

ORGANIZATION

Mosaic Corporation

OVERVIEW

- World's leading producer of potash and phosphate crop nutrients
- Annual net sales exceeding \$9.8 billion
- Employs approximately 7,400 people worldwide

PRODUCTS USED

Minitab® Statistical Software

RESULTS

- Increased recovery rates to over 80%
- Over 50% increase in concentrate phosphate rock production
- A financial impact of \$12 million per year
 - \$8 million from increased production
 - \$4 million from decreased reagent needed per ton of rock processed

In 2008, the Mosaic Corporation, the leading producer of potash and phosphate nutrients for agriculture, began an effort to improve the productivity of its Wingate phosphate mining operation in Florida. In the industry, rock recovery—the percentage of valuable material derived from ore—averages 85 to 90 percent. Wingate operated at just 47 percent rock recovery, a figure that raised concerns about the mine's long-term viability. At the outset, managers expected minimal change. But armed with an excellent knowledge of process improvement and powerful tools including Minitab® Statistical Software, the Six Sigma team increased productivity by more than 50 percent and made a financial impact of more than \$12 million per year. The team's project also won a 2009 Process Excellence Award from the International Quality and Productivity Council.

The Challenge

The Wingate Mine had been owned by several companies over the years, but never performed to expectations. For that reason it was closed in 1999, and remained so until Mosaic acquired and restarted it in 2007. But the reopened mine's low recovery rates couldn't sustain continued operation long.

Phosphorus is extracted from raw ore through a process called beneficiation. At Wingate, mined ore is slurried into a pit, then pumped to the beneficiation plant. There, pebbles, fine clays and sand are separated from the phosphate rock by washing and screening. The phosphate rock is then treated with reagents for further refining. Somewhere in this process, the mine was falling short. It fell to Six Sigma Black Belts Joe Gliksmann and John Whitley to apply their knowledge of quality improvement methods to help the mine's staff boost profitability, and they brought Minitab with them.

Learn how Minitab software can help you improve quality at www.minitab.com.

Mosaic has invested in Lean Six Sigma since the company was founded in 2004 by the merger of Cargill and International Minerals Corporation. In 2008 alone, its quality initiatives involved more than 45 teams, engaged over 500 employees and delivered close to \$25 million to the company's bottom line. But when the Wingate Mine team began their work, expectations were minimal. "Managers hoped for a 2 or 3 percent increase in recovery rates," Gliksman recalls. "They told us that sustained 70 percent recoveries at this mine would be a miracle."

How Minitab Helped

Undaunted by the challenge, Gliksman and Whitley gathered a team that included all groups involved in the process, including engineers, equipment operators, mechanics, lab techs, supervisors, and even a representative of the company that provides chemical reagents for beneficiation.

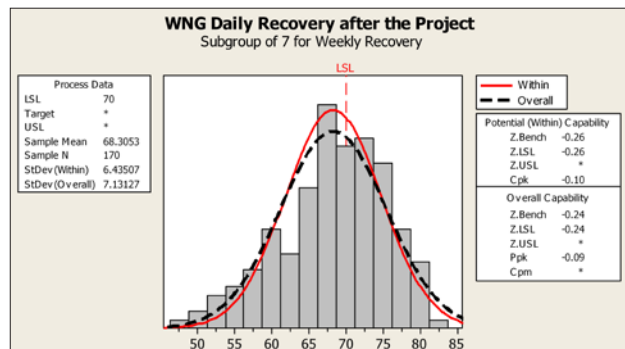
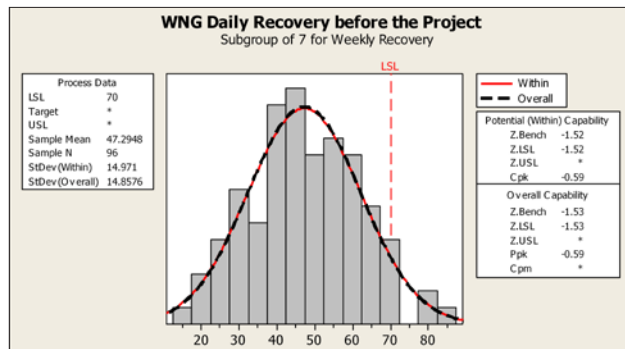
They examined current mine operation data using Minitab's capability analysis, which provides insight into how well a process is performing and how it might be improved. The analysis substantiated management's concerns about the mine's performance. "Over half the time, the recovery rate wasn't coming close to our 70 percent target," Gliksman notes.

The team brainstormed, process-mapped the flow of ore through the facility, and conducted a cause and effect analysis to identify points in the beneficiation process with the greatest potential for increasing recovery rates. To quickly obtain meaningful conclusions about how well different ideas would work, the team used Minitab's design of experiments feature, which makes it easy to simultaneously evaluate multiple factors. Based on the results of this initial work, operators were able to immediately begin making changes, and additional opportunities for improvement were identified.

As the team's improvements began having an impact, they used Minitab's Gage R&R, variance testing, and control chart functions to verify the accuracy of their results, confirm the effectiveness of the improvements they made, and demonstrate that the improvements were being sustained.

Results

Within 30 days of the project's start, the mine's rock recovery rate soared from 47 percent to over 68 percent—nearly a 50 percent increase in concentrate phosphate rock production. The project has yielded financial benefits worth \$12 million per year, with \$8 million attributable to the mine's increased phosphorus production, and \$4 million in cost savings due to the reduced amount of reagent needed per ton of ore the mine processes. The project also resulted in a tremendous culture shift, as the mine operators are now able to see how the results of their improvement efforts also improve the bottom line. Improvement projects have continued at the Wingate Mine, and the implementation of additional ideas has increased recovery rates to over 80 percent. Thanks to the team's hard work, with critical support from Minitab's powerful but easy-to-use data analysis tools, a mine that once might have been closed has gained new life, along with an energized workforce that continues to find new ways to improve processes.



The team used Minitab to run capability analyses before and after implementing improvements. Minitab makes it easy to see the project's dramatic impact, as the average amount of rock recovered leaped from around 47 percent to nearly 70 percent in less than 30 days. Subsequent projects have raised Wingate Mine's recovery rates even higher.